

NAVIGATION AND VESSEL INSPECTION CIRCULAR NO. 8-93

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Subj: EQUIVALENT ALTERNATIVES TO 46 CFR SUBCHAPTER H REQUIREMENTS  
RELATED TO MEANS OF ESCAPE, SAFE REFUGE AREAS, AND MAIN VERTICAL  
ZONE LENGTH.

1. PURPOSE. The purpose of this Circular is to provide equivalent alternatives to existing requirements for means of egress, safe refuge areas, and limitation of main vertical zone (MVZ) length for certain passenger vessels required to meet the structural fire protection requirements of 46 CFR Subchapter H. The policies in enclosure (1) update those previously published in NVIC 14-91. Enclosure (2) provides equivalent alternatives to 46 CFR Subchapter H limitations on the mean length of MVZ's.
  - a. The alternatives in enclosures (1) and (2) are applicable only to vessels which:
    - (1) Do not operate on international voyages subject to SOLAS;
    - (2) Have no overnight passenger accommodations; and
    - (3) Are comprised predominantly of large public spaces which generally encompass the entire length and breadth of each main vertical zone.
  - b. In addition to the above, the guidance in enclosure (1) is only applicable to vessels which:
    - (1) Are certificated under Subchapter T or H; and
    - (2) Operate in protected or partially protected waters.

"Protected waters" means sheltered waters presenting no special hazards such as most rivers, harbors, lakes, etc.

"Partially protected waters" means: (1) Waters within 20 nautical miles of the mouth of a harbor of safe refuge, unless determined by the Officer in Charge, Marine Inspection (OCMI) to be exposed waters; and (2) Those portions of rivers, harbors, lakes, etc. which the OCMI determines not to be sheltered.
  - c. In addition to the above, the guidance in enclosure (2) is only applicable to vessels which:

by this enclosure; and

- (2) Operate only on waters determined by the cognizant OCMI to be protected waters.

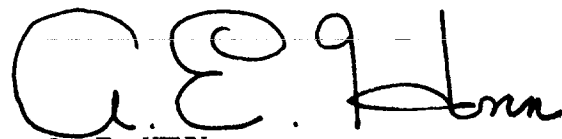
{NOTE: The guidance in both enclosures may not be applied to vehicle ferries. It may be applied to non-vehicle ferries which meet the above criteria.}

2. DIRECTIVES AFFECTED. NVIC 14-91, dated 2 October 1991, is canceled. The applicability of Commandant (G-MTH) Policy File Memorandum 3-89, "Draft Stop Requirements for 46 CFR Subchapter T Vessels," is canceled for all vessels to which the alternatives offered in this NVIC are applied.
3. BACKGROUND.
  - a. Coast Guard fire protection regulations have been developed over the years primarily based upon passenger ships which operate in ocean service. The passenger densities of these vessels are relatively low since they traditionally provide overnight accommodation spaces for all persons on board. The requirements of 46 CFR 72.05-20 are based on the philosophy that all passengers in each MVZ should be provided with a direct, protected means of egress to the embarkation deck via stairtowers. Stairtowers provide avenues of egress which protect passengers from the hazards of fire, smoke and exposure to weather. Further, stairtowers provide direct access to the embarkation deck so that passengers can proceed to primary lifesaving equipment without exiting a protected space, should this become necessary.
  - b. There is an increasing public demand for dinner excursion and gambling trade vessels which have large public spaces, no overnight passenger accommodations, and operate close to land. These vessels have much higher passenger densities than those envisioned when Subchapter H was developed. The size and configuration of many of these vessels do not easily permit the incorporation of certain Subchapter H design requirements. Since weather hazards encountered in protected and partially protected waters are less severe than those encountered in ocean routes, it is appropriate to permit weather deck egress, if fire safety is not jeopardized. However, it is inappropriate to assume that a vessel will be capable of returning to shore to discharge passengers in sufficient time to avoid a major casualty in the event of a shipboard fire. Thus, it is imperative that these vessels be capable of serving as their own rescue platform with properly designed egress and safe refuge systems, structural fire protection, and fire protection equipment.
4. DISCUSSION.
  - a. This publication is primarily oriented towards the technical aspects of ship design and is intended to be used by architects, engineers and Marine Safety Center personnel, and to a lesser extent by the cognizant Officer in Charge, Marine Inspection.

- (2) NVIC 6-80, "Guide to Structural Fire Protection Aboard Merchant Vessels";
  - (3) COMDT (G-MTH) Policy File Memorandum (PFM) No. 1-93, "Fire Protection Relating to Elevators
  - (4) NVIC 10-93, "Guidance to the Acceptance of NFPA 13 for Automatic Sprinkler Design, Installation and Maintenance"; and
  - (5) NVIC 16-91, "Special Fire Protection Systems for Atriums.
- c. The alternatives outlined in this NVIC make use of technological advancements made in fire safety since promulgation of Subchapter H. Incorporation of active fire safety Systems, coupled with route restrictions and design and performance standards for emergency egress and refuge systems, permit the acceptance of alternative designs which provide a level of safety equivalent to that established in existing regulations. The guidance in enclosures (1) and (2) is based on a modified land-based flow criterion that recognizes the dynamics of people movement to areas of refuge through restricted openings. The underlying safety philosophies upon which this guidance is based call for vessel designs which incorporate a balanced approach to life safety. This balance is achieved through the use of passive and active safety features and equipment which address safety concerns involving passenger capacity and distribution, fire prevention, provision of adequate means of egress and on board qualified refuge areas, fire and smoke control and containment, and fire suppression.
- d. Enclosure (3) provides definitions for terms used in enclosures (1) and (2).

5. IMPLEMENTATION.

- a. Vessels to which enclosures (1) and/or (2) apply may be -designed to the applicable requirements of Subchapter H or Subchapter H as modified ~ the alternatives described in the enclosures. Vessel owners electing to employ the alternatives outlined in this NVIC must do so in all areas. The alternatives may not be applied in a piecemeal fashion. As always, the Coast Guard will consider other designs, arrangements and equipment which are demonstrated to provide an equivalent level of safety. This includes alternatives that incorporate state-of-the-art lifesaving equipment (i.e., evacuation slides, inflatable liferafts, etc.) subject to the concurrence of the OCMI in whose area the vessel will be operating.
- b. Certain vessels incorporating the alternatives provided in enclosures (1) and/or (2) will require the use of one or more advanced fire safety systems such as automatic sprinklers, smoke extraction systems, targeted emergency announcement systems, etc. Plans related to these systems are particularly good candidates for submission to the Marine Safety Center under the provisions of NVIC 10-92, "Coast Guard Recognition of Professional Engineer Certification of Compliance with Coast Guard Regulations."

A handwritten signature in black ink, appearing to read "A. E. HENN". The letters are stylized and connected, with a prominent "A" and "E".

A. E. HENN

Rear Admiral, U.S. Coast Guard  
Chief, Office of Marine Safety,  
Security and Environmental Protection

**for Certain passenger Vessels  
operating in protected or partially protected Waters**

**GENERAL**

1. In lieu of full compliance with certain Subchapter H structural fire protection requirements, vessels to which this enclosure applies may be designed to Subchapter H as modified by the equivalent alternatives contained herein.
2. This enclosure provides guidance for determining the maximum number of persons (passengers and crew) that may be assumed to occupy various spaces. Once maximum capacities have been determined, egress components (i.e., stairtowers, stairways, landing areas, doors, corridors, etc.) may be sized. This guidance is based on a modified land-based flow criterion that recognizes the dynamics of people movement to areas of refuge through restricted openings.
3. The equivalent means of egress alternatives described herein require that each MVZ be served by at least one stairtower. The remaining egress components needed to fulfill the required 100% egress capacity for each space may be provided by stairways directly accessing qualified refuge areas, doors that lead directly to weather egress systems and/or doors in MVZ bulkheads directly accessing qualified refuge areas. Some restrictions apply, as described later in this enclosure. No other exits may be considered to contribute to the required means of egress capacity. Stairtowers and stairways must be sized to accommodate the number of persons expected to occupy spaces or areas on a deck-by-deck basis. Stairtowers and stairways serving multi-deck spaces require special treatment, see paragraph 17. A continuous protected avenue of egress must also be provided from qualified refuge areas to an embarkation area. See paragraphs 18 and 19, below.
4. A qualified refuge area must be provided for all passengers and crew to protect them from the effects of fire. The requirements for qualified refuge areas vary depending on vessel size and arrangement. In general, qualified refuge areas must be properly sized, protectively bounded, and provide protected access to the embarkation area. Spaces adjacent to qualified refuge areas may require an automatic sprinkler system or other appropriate fire suppression system. See Tables 1 and 2.
5. The crew plays an essential role in any shipboard emergency. During an evacuation, they must react swiftly to control passenger movement and direct them to refuge areas. An Emergency Evacuation Plan (EEP) is required for each vessel designed using the alternatives described in this NVIC. Each member of the crew must be required to become familiar with the content of the EEP and the actions they should take in the event of a shipboard fire.

**DETERMINATION OF MAXIMUM NUMBER OF PERSONS PERMITTED**

6. The maximum number of persons (passengers and crew) permitted on a vessel, and the maximum number of persons considered to occupy the various spaces for the purpose of sizing egress components, shall be determined as indicated below.

(COI) to limit the total number of persons allowed on board during these periods to the number for which interior spaces were designed. For example, a casino vessel with a total capacity of 800 persons, of which 200 are accounted for by weather deck seating and deck area, would have its COI endorsed for the carriage of a total of 600 during seasonally cold/inclement months. Special consideration may be given for a vessel normally engaged in casino service if, on occasion, it provides ferry service to and from a special event. In such cases, it is possible that the vessel will be loaded to capacity and that passengers will be carried on open decks in inclement weather. The above provisions for limitation of passenger capacity during seasonally cold, inclement months are intended to limit passenger capacity only when the nature of the vessel's service is such that passenger activities are generally confined to interior spaces. In all cases, owners and operators of vessels with egress and refuge system designs reliant on weather deck egress routes and qualified weather deck refuge areas must ensure these areas are kept clear of ice and snow whenever passengers are on board.

8. In spaces such as lounges, club rooms, casinos, dining facilities with non-fixed seating, and other similar spaces designated for passenger use (including weather decks), the maximum number of persons permitted is the greater of that permitted by the deck area criterion or fixed seating criterion described below. Where appropriate, the two criteria may be combined within a given space to determine the total number of persons considered to occupy the space. (See paragraph 12 below concerning stability considerations.)

- a. Deck Area Criterion. One person may be permitted for every  $0.93 \text{ m}^2$  ( $10 \text{ ft}^2$ ) of gross deck area.

[NOTE: The  $0.93 \text{ m}^2/\text{person}$  ( $10 \text{ ft}^2/\text{person}$ ) gross area "rule" is used to simplify, in the early design stage, the determination of the maximum number of persons that may be carried and the sizing of egress components and refuge areas. To ensure that the available (net) deck area is not excessively reduced after accounting for slot machines, tables, loose chairs and other room furnishings, a minimum net deck area of  $0.65 \text{ m}^2/\text{person}$  ( $7 \text{ ft}^2/\text{person}$ ) must be provided. It is appropriate for the cognizant OCMI to further limit the number of persons permitted, if the percent age of furnishings is such that less than  $0.65 \text{ m}^2$  ( $7 \text{ ft}^2$ ) net deck area is provided for each person in a given space. The Marine Safety Center should be consulted in such cases.]

In computing gross deck area, areas occupied by the following must be excluded:

- (1) Obstructions, including stairway and elevator enclosures, elevated stages, bars, cashier stands, etc., but not including slot machines, tables or other room furnishings;
- (2) Areas for which the number of persons permitted is determined using the fixed seating criterion;
- (3) Toilets and washrooms;
- (4) Interior passageways less than 86 cm (34 in) wide and passageways on open

as netting on multi hull vessels.

- b. Fixed Seating Criterion. One person may be permitted for each fixed chair or 46 cm (18 inches) of width of fixed bench seating provided.
9. For determining the maximum number of persons on board, crew should be assumed to be occupying public and service spaces. Crew spaces include; working spaces, crew lounges, and may be sized based on their normal operating capacity. If crew sleeping spaces are provided, means of egress from these spaces must be sized for their full capacity.

#### QUALIFIED REFUGE AREAS (QRA)

10. Qualified refuge areas must be provided for all persons on board. Standards for on board qualified refuge areas differ depending on vessel size and arrangement. In the event of fire, complete evacuation of the fire affected MVZ is preferred. A greater degree of protection must be provided for qualified refuge areas which are located within a fire affected MVZ. When designing qualified refuge areas and Stage I and II Egress routes, it is necessary to consider the possibility that a fire may originate in any space (other than those which pose no fire risk, such as voids, cofferdams, tanks, etc.). The fire safety measures required by this NVIC are intended to ensure that a fire will be contained in the space of origin, which may be assumed for the purposes of design. Each fire scenario must be examined to ensure that egress routes and qualified refuge areas are -available under any circumstance.
11. Standards for qualified internal and weather deck refuge areas are outlined in Tables 1 and 2 of this enclosure, respectively. In cases where Tables 1 and 2 do not indicate a standard for a specific fire division, the requirements of Subchapter H apply. The maximum number of persons assumed to occupy qualified refuge areas shall be determined using the guidelines provided under "Determination of Maximum Number of Persons Permitted," except that when applying the deck area criterion, one person may be permitted in the refuge area for every 0.47 m (5 ft<sup>2</sup>) of gross deck area.

#### STABILITY CONSIDERATIONS

12. The maximum number of persons permitted as determined using the criteria outlined in this enclosure may be further limited by stability considerations, or by the cognizant OCMI. Stability calculations submitted to the Marine Safety Center for approval must include the various possible distributions of passengers and crew at qualified refuge areas and any anticipated egress scenarios which may occur during an emergency evacuation, if these conditions present the worst case with respect to vessel stability. Due consideration must be given to asymmetrical egress arrangements which could result in passenger crowding to one side of the vessel.

#### **STAGE I EGRESS - EVACUATION OF THE SPACE OF FIRE ORIGIN AND MOVEMENT TO QUALIFIED REFUGE AREAS**

refuge areas in a matter of minutes, before the fire develops to the point that the integrity of bulkheads and windows is seriously threatened. The minimum "two means of escape" requirements contained in 46 CFR 72.10 remain applicable.

14. Stage I Egress routes should be widely separated, marked as required by 46 CFR Subchapter H, and be directly accessed from public spaces by "simple modes." Simple modes include passage through a single set of exit doors or stairtower doors as follows:
- a. Exits to stairtowers, or stairways which lead directly to adequately sized qualified refuge areas. At least one stairtower must serve each MVZ. Where multiple deck public spaces are served by such stairtowers, the stair tread width limits egress flow. See paragraphs 17, and 23-26 regarding the sizing of egress components for multiple-deck spaces. Stairways that are wholly within a balcony or atrium, providing access within that space, are not considered to contribute to the required means of egress.
  - b. Exits opening directly to weather decks where a continuous egress path to qualified refuge areas is provided, or
  - c. Exits through an MVZ bulkhead that directly access an adequately sized, adjacent public space which is a qualified refuge area, provided that such exit doors open in the direction of egress. For doors in MVZ bulkheads to receive credit for service in two directions and take advantage of bidirectional swinging doors, they must provide direct access to enclosed qualified refuge areas on each side of the MVZ bulkhead. practically, these doors should be installed in pairs, where one leaf of the pair opens in the direction of egress from one zone, while the other leaf opens in the opposite direction. Each leaf of the pair must be provided with its own releasing device. Devices that depend on the release of one door before the other can be released may not be used. The full clear width of the pair(s) of bidirectional doors may be used in determining egress capacity. These exits may, however, only receive credit as Stage I Egress components for persons assumed to be distributed within 22 m (72 ft) of the doors. See Figure 1.

[NOTE: The cumulative width of all doors in an MVZ bulkhead on any deck is limited to 25% of the breadth of the MVZ bulkhead on that deck. The intent of this limitation is to preserve the integrity of the fire boundary while allowing doors in MVZ bulkheads to contribute to Stage I Egress capacity. If the MVZ bulkhead does not lie in one vertical plane, the "breadth" may be measured cumulatively across the transverse faces of the MVZ bulkhead. Portions of MVZ bulkheads that form stairtower enclosures should be excluded from this determination.]

15. On vessels having two or more decks, at least one of the required means of egress from each main vertical zone must be a stairtower. A single stairtower may serve two adjacent MVZ's, but need not be sized to accommodate all persons in the spaces served. It should be assumed that only one space will need to be evacuated at a time. The complement of the egress components for each space must be sized to accommodate the remainder of all those persons who can not be accommodated by the stairtower. The existing requirements in 46 CFR 72.10, regarding "two means of escape"<sup>1</sup> apply. Elevators may not be considered as one of the required means of egress.



exposed decks. Stairtowers must extend to these and other decks where qualified refuge is provided, even if these decks are not normally accessible to passengers. Uppermost decks that are accessible to passengers, even if not refuge areas, must have direct access to a stairtower.

## MULTIPLE-DECK SPACES

17. Multiple-deck spaces present unique challenges with respect to egress since a fire originating on any level of the space impacts the safety of persons on all levels, thus necessitating simultaneous evacuation of the entire multilevel space. To this end:
  - a. The design of the egress system must ensure that simultaneous evacuation of all levels of the space does not delay the egress of occupants due to overloading of stairways. Therefore, stairtowers and stairways (including exterior stairways) may only receive "credit" for the number of persons for which they are designed. For example, assume that the doors and stair tread width of a stairtower serving a three-deck atrium are sized to accommodate 200 persons. In this case, a total of 200 persons may be assumed to exit the atrium via this stairtower - not 200 persons from each level of the atrium. The 200 persons assumed to exit the atrium via this stairtower should be proportionately distributed among the various levels based on the ratio of the number of persons assumed to normally occupy each level, to the total number of persons assumed to occupy the atrium. The remaining persons in the multiple-deck space must use other Stage I Egress components. See paragraph 26 for sizing.
  - b. Public spaces encompassing two decks, such as balcony arrangements, must be protected by an automatic sprinkler system. The deck opening in both balconies and atriums should be substantial, such that occupants on each level have a sense that both decks belong to the same space for reasons of fire safety. The National Fire protection Association (NFPA) Life Safety Code suggests that the minimum dimension of the opening should be not less than 6 m (20 ft) across with an area of not less than 93 m<sup>2</sup> (1000 ft<sup>2</sup>). Since this may not be practical for smaller vessels, deck openings, on all vessels, should be sized to be not less than 20% of the full deck area without the opening (within the enclosed public space). Where it is not practical to have deck openings this large, such openings shall be protected around the perimeter by automatic sprinklers and draft stops as indicated in NFPA 13, Chapter 4, paragraph 4.4.1.7.3.4. Briefly, this requires a draft stop extending down below the ceiling into the lower space 46 cm (18 in) deep surrounding the opening and automatic sprinklers fitted at not more than 1.8 m (6 ft) intervals around the perimeter.
  - c. Except as described above, deck to deck integrity must be maintained. Public spaces that contain openings in the bulkhead deck will require special consideration.

## STAGE II EGRESS - EGRESS FROM QUALIFIED REFUGE AREAS TO EMBARKATION AREAS

and provides access to the embarkation area from within each MVZ. The following arrangements are also considered acceptable:

- a. Type 1 stairtowers which can be accessed directly from the qualified refuge areas; or
  - b. Routes via non-affected qualified refuge areas leading to port and starboard embarkation areas which can be directly accessed from the qualified refuge areas being considered.
19. The embarkation area is considered to be on the deck from which passengers board primary lifesaving equipment. If passengers are not lowered to the water in survival craft via davits or launching devices, the embarkation deck should be the deck closest to the water, generally no more than 2.0 m (6.5 ft) above the waterline, to allow the safest access for passengers to reach lifesaving equipment, rescue vessels, or the shore, from the vessel.
20. Title 46 CFR 72.05-20(s)(3) requires that each Type 1 stairway or stairtower provide at least 112 cm (44 in) of exit door width to each side of the vessel on the embarkation deck, either directly to weather, or indirectly by passageways and/or corridors which lead to weather. The Commanding Officer, Marine Safety Center may accept alternative arrangements considered to provide an equivalent level of safety to this requirement. Specifically, stairtower arrangements may be accepted which provide access to only one side of the vessel on the embarkation deck, provided that the design includes adequate and redundant means of egress for persons in qualified refuge areas to gain access to embarkation areas on the opposite side of the vessel. At least one of these means of egress must meet the protection requirements for Stage II Egress routes described in this enclosure.
21. There must be at least two means of egress provided from the vessel to the pier or dock for vessels which have passengers on board while moored.

#### ALTERNATIVE STAIRTOWER ARRANGEMENTS

22. Many vessels to which this NVIC may be applied incorporate a galley and/or other spaces where a fire may originate below decks. Taken together, the requirements of 46 CFR 72.05-20(e) and 72.05-20(f) may be difficult to satisfy on certain vessels. Essentially, the former requires stairtowers to extend to all decks, and the latter discourages designs where stairtowers provide direct access to accommodations or other enclosed spaces in which a fire may originate. Where it is impractical to comply with 72.05-20(f), and in order to improve the safety of such arrangements while permitting design flexibility, the Commanding Officer, Marine Safety Center may accept stairtower arrangements determined to provide an equivalent level of safety to designs meeting regulatory standards. Specifically, stairtowers which do not extend to below-deck spaces may be accepted, if these spaces are provided with adequate (stairway) means of egress directly to a weather deck. Persons exiting the below deck space to weather must be provided access to an embarkation area as well as access to either a stairtower or qualified refuge area, without entering a fire affected space. Alternatively, the Commanding Officer, Marine Safety Center, may also accept other arrangements which include self-closing fire doors at both the top and bottom of a stairway leading from the below-deck space to a stairtower enclosure,

23. The requirements for stairtower landing areas in 46 CFR 72.05 20(r)(2) need not be applied. Landings for all stairways (including stairtowers) must meet the requirements of 46 CFR 72.05-20(r)(1) and (3).
24. The minimum tread width of interior and exterior stairways and stairtowers is determined by multiplying the number of persons to be served by that stairway or stairtower by 0.846 cm/person (0.333 in/person). The tread width of required stairtowers may not be less than 112 cm (44 in). The tread width for other stairways may not be less than 92 cm (36 in), unless the stairway is for crew use only, in which case the clear width may not be less than 72 cm (28 in). The number of persons who will be using the stairways and stairtowers must be determined for the spaces served on a deck-by-deck basis using the guidelines provided in the above section titled "Determination of Maximum Number of Persons permitted". On any particular deck, only those persons in areas assigned to use a stair are involved in the width determination. However, once a minimum required width has been established at any one level, that width may not be reduced at any subsequent deck level in the direction of Stage I Egress.

[NOTE: The Commanding Officer, Marine Safety Center, may approve stairway widths less than 0.846 cm/person (0.333 in/person) served if, based on the arrangement of any available weather deck area (adjacent to exterior stairs) or stairtower landing area, it is demonstrated that use of a narrower stairway will not impede the flow of persons out of a space where fire has originated. In other words, a particular arrangement may provide an exterior stairway or stairtower landing area which is in excess of minimum requirements. If this excess landing area is arranged such that persons exiting the deck can reasonably be expected to distribute themselves in this area while waiting for the stairway to become clear, then the designed capacity of the stairway may be reduced by the number of persons for which excess landing area is provided. Such landing areas may be considered to accommodate one person for every 0.33m<sup>2</sup> (3.5 ft<sup>2</sup>) available. In no case may the stairway width be less than the minimum widths noted above.]

25. Other means of egress components, such as doors and passageways, must be at least 82 cm (32 in) in width or 0.846 cm/person (0.333 in/person) multiplied by the number of people to be served by that egress component, whichever is greater. All egress components must allow for the easy movement of persons wearing life preservers. There must be no protrusions which could cause injury, ensnare clothing, or damage life preservers. Except as indicated in paragraph 14.c above, doors must open in the direction of Stage I Egress from the space and must open clear of the egress path such that flow is not impeded. The number and dimensions of the means of egress components for each space must be sufficient for the maximum number of persons assumed to occupy that space as determined using the guidelines provided in the section above on "Determination of Maximum Number of Persons Permitted."
26. If the desired personnel capacity, or the personnel capacity allowed by stability calculations, is less than that determined using the guidelines under "Determination of Maximum Number of Persons Permitted," the egress components may be sized for the lower capacity. If this is done, however, Coast Guard records will reflect the fact that maximum passenger capacity is governed by stability considerations and/or the sizing of egress components.

27. An atrium is a public space which spans three or more decks. The guidance in NVIC 16 91, "Special Fire Protection Systems for Atriums," applies.
28. NVIC 16-91 requires that the entire MVZ containing an atrium be protected by a smoke detection system. Since vessels employing the alternatives in this NVIC are not permitted to have overnight passenger accommodations, it is reasonable to expect that atriums on these vessels will be occupied by a large number of people whenever passengers are aboard. Each passenger and crew member is, in effect, a smoke detector.

Thus, it is not considered necessary that the smoke detection system provide coverage of atria on these vessels provided that:

- a. All spaces, other than the atrium itself, which pose a risk of fire and which are located within the MVZ containing the atrium are served by a smoke detection system; and
  - b. The atrium space is served by an approved manual alarm system complying with the requirements of 46 CFR 76.35. If this alternative is employed, manual alarm boxes must be located in the vicinity of each exit from the atrium which contributes to the required Stage I Egress capacity.
29. When designing the smoke extraction system required by NVIC 16-91, designers should be guided by the standards in NFPA 92B, "Smoke Management Systems for Malls, Atria, and Large Areas." NVIC 16-91 requires that the smoke extraction system be activated by the required smoke detection system and be capable of manual control. For atrium spaces not served by a smoke detection system (see alternative in preceding paragraph), the smoke extraction system must be activated by both the manual alarm system and by water flow in the appropriate zone(s) of the required automatic sprinkler system. The smoke extraction system should be designed such that smoke exhausting from the system is unlikely to contaminate Stage I or Stage II Egress routes, refuge areas, embarkation areas, lifeboat/liferaft stowage or lowering stations, and areas where passengers and crew may need to assemble or occupy in the event of a fire.

#### PROTECTION OF WINDOWS IN BOUNDARIES ADJACENT TO EXTERIOR QUALIFIED REFUGE AREAS OR STAGE II EGRESS ROUTES

30. Window or glazing assemblies adjacent to or below "Qualified Weather Deck Refuge Areas" or "Stage II Egress Routes" need to be rated as fire resistant or otherwise protected to maintain the intended fire resistance of the boundaries, and must satisfy one of the following criteria:

[NOTE: When window assemblies are installed in areas horizontally adjacent to external safety areas, the windows may not extend below a storm rail location, approximately 1 m (35 in) above the deck level.)

- a. Glazing assemblies may be used that meet the fire resistance testing standards described in NFPA 251, "Standard Methods of Fire Tests of Building Construction and Materials," 1990 Edition, Chapters 1-5 and 7; or, Underwriters Laboratories (UL), "Fire Tests of

testing has been accomplished. Such testing should be fully documented, including limitations and the approximate resulting fire resistance rating. Details of such arrangements should include the type of glazing, thickness, maximum dimensions, framing specifications and other relevant parameters.

- c. Tempered or laminated glass window assemblies of not less than 6.5 mm (1/4 in) thickness meeting no specific fire resistance requirement may be used where: the adjacent enclosed spaces contain a combustible fuel loading of not more than 14.5 kg/m<sup>2</sup> (3 lb/ft<sup>2</sup>) and are protected by an approved automatic sprinkler system, including dedicated automatic sprinklers specifically arranged and designed to protect such exterior windows. Such window glazings must be held in place by a gasket system that permits the glass framing system to deflect without breaking (loading) the glass before the sprinklers operate, and fitted with steel clips to prevent glazings from falling out where window framing materials are heat sensitive or do not otherwise keep intact glazings from falling out under fire conditions. Automatic sprinkler systems using this provision for window protection must be designed and installed in accordance with NVIC 10-93, "Guide to the Acceptance of National Fire Protection Association Code No. 13 for Automatic Sprinkler System Design, Installation and Maintenance." Window assemblies containing wire inserted glass may be treated similarly.

Alternative arrangements of protecting glazing assemblies that are shown by fire testing to provide effective fire resistance will be considered by Commandant (G-MTH-4) on a case-by-case basis. Such testing may show different glazing dimensions can be used, if different water flow rates are effective, or alternative window glazing and/or framing materials result in an equivalent barrier.

31. Where windows are installed in doors, or in sidelights adjacent to doors, they may be subject to human impact. Such windows or glazings should meet the impact requirements of American National Standards Institute (ANSI) Z97.1-1984, Standards for Architectural Safety Glazing Materials and/or Consumer Products Safety Standard 16 CFR 1201 "Safety Standard for Architectural Glazing Materials."

#### DOCUMENTATION OF COMBUSTIBLE FIRE LOAD

32. For new construction, calculations and documentation must be submitted to the Marine Safety Center for review of the combustible fire load. The fire loads must not be increased over time for each space required by this NVIC to maintain a combustible fire load of not more than 14.5 kg/m<sup>2</sup> (31b/ft<sup>2</sup>). Whenever internal furnishings are altered such that the fire load within the space may have increased, the vessel owner must submit calculations and documentation to demonstrate that the fuel loading of the space remains below the allowable limit.

#### ELEVATORS

33. Elevators should be designed using the guidelines provided in G-MTH Policy File Memorandum 1-93. Elevators constructed to American National Standards Institute/American Society of

34. Draft stops (46 CFR 72.05 10(h)) are not required above/around large public spaces provided all of the following conditions are met:
- a. The space in question is surrounded by A-Class divisions or extends to the outer shell of the vessel.
  - b. The space in question is open and unobstructed such that a fire in any part of the space will quickly be discovered.
  - c. The area above the ceiling is easily accessible from below for fire fighting purposes.
  - d. Combustibles in the space above the ceiling are limited to electrical cable for lighting circuits.

#### EMERGENCY EVACUATION PLAN (EEP)

35. The crew provides an essential service in time of emergency. The Emergency Evacuation Plan (EEP) provides information to the master and crew regarding procedures they must carry out in the event of a shipboard fire. The EEP should generally be in the form of a pamphlet providing a written description of the various safety features and emergency procedures. In addition, the EEP should contain simplified diagrams of the vessel's emergency egress and refuge systems, and descriptions of fire protection equipment. Each member of the crew should be required to become familiar with these systems so they can direct passengers to safe refuge areas in an emergency and take appropriate action to contain and combat the fire. When conducting drills during inspections for certification and reinspections, Coast Guard Marine Inspectors will query the crew on the content of the EEP to ensure they are familiar with the egress and refuge systems.
36. The EEP must be submitted to the Marine Safety Center for review along with detailed plans which:
- a. Identify the number of persons (passengers and crew) assumed in each enclosed space and weather deck area and how the number was determined;
  - b. Identify possible fire scenarios (including fire in the largest capacity passenger space in each MVZ) and describe the flow of passengers and crew to qualified refuge areas (Stage I Egress routes), for each situation;
  - c. Show egress component dimensions and capacities;
  - d. Identify and describe the characteristics and capacities of qualified refuge area(s) where passengers will muster in the event of a fire;
  - e. Identify the embarkation areas and show how passengers would be evacuated to them from qualified refuge areas (Stage II Egress routes), and then from the vessel (develop a plan for abandoning ship);

structural fire protection, ventilation system, and egress system design.

**1: STANDARDS FOR INTERNAL QUALIFIED REFUGE AREAS**

SAFETY FEATURE	MULTIPLE-MVZ VESSELS WHICH PROVIDE QUALIFIED REFUGE AREA FOR ALL PERSONS ON BOARD AFTER EVACUATION OF THE HIGHEST CAPACITY MVZ	VESSELS WITH ONE MVZ AND MULTIPLE MVZ VESSELS WHICH DO NOT PROVIDE QUALIFIED REFUGE AREA FOR ALL PERSONS ON BOARD AFTER EVACUATION OF THE HIGHEST CAPACITY MVZ
/ LOCATION OF SPACE	Public spaces* located above the bulkhead deck which are not within the fire affected MVZ.	Public spaces* located above the bulkhead deck.
STRUCTURAL FIRE PROTECTION BULKHEADS AND DECKS	MVZ boundaries must be insulated to A-60.	The space must be bounded by A-60 bulkheads and decks, except that bulkheads and decks adjacent weather and other low fire risk spaces (such as voids, cofferdams, tanks, etc.) may be A-0 unless a higher standard is otherwise required by Subchapter H.
ISOLATION SYSTEMS	May not serve more than one MVZ.	May not serve more than one MVZ. Within an MVZ ventilation systems serving the qualified refuge space must be completely independent of any other space or be separated from other spaces within MVZ by smoke and fire dampers. Dampers meeting requirements of 46 CFR 72.05-50(b) and (e) and Underwriters Laboratories, Inc. "Standard for Leakage Rated Dampers for Use in Smoke Control Systems" (UL 555s) are considered acceptable.
SUPPRESSION SYSTEMS	Except as provided below, spaces which share common boundaries with the qualified refuge area and which pose a risk of fire (such as accommodation, service and machinery spaces) must be protected by an appropriate fixed automatic fire suppression system.	No exceptions.
	Accommodation spaces with fire loads less than or equal to 14.5 kg/m <sup>2</sup> (3 lb/ft <sup>2</sup> ) which share common boundaries with qualified refuge areas need not be protected by a fixed automatic fire suppression system if veneers and trims used in the qualified refuge areas are incombustible.	

meaning of the term "public space" used in this Table means a public space as defined in 46 CFR 72.05-5(b)(1).



**E 2: STANDARDS FOR WEATHER DECK QUALIFIED REFUGE AREAS**

SAFETY FEATURE	MULTIPLE-MVZ VESSELS WHICH PROVIDE QUALIFIED REFUGE AREA FOR ALL PERSONS ON BOARD AFTER EVACUATION OF THE HIGHEST CAPACITY MVZ	VESSELS WITH ONE MVZ AND MULTIPLE MVZ VESSELS WHICH DO NOT PROVIDE QUALIFIED REFUGE AREA FOR ALL PERSONS ON BOARD AFTER EVACUATION OF THE HIGHEST CAPACITY MVZ
EVACUATION	Weather decks not within the fire affected MVZ.	Any weather deck area.
SUPPRESSION SYSTEMS	No special requirements beyond Subchapter H.	Spaces which share common boundaries with the qualified refuge area and which pose a risk of (such as accommodation, service and machinery spaces) must be protected by an appropriate fire automatic suppression system.
STRUCTURAL FIRE PROTECTION DECKS AND BULKHEADS	No special requirements beyond Subchapter H.	The deck (except areas in way of overhangs, fuel water, ballast tanks, and voids, etc.), must be insulated to A-60. Adjacent bulkheads must be insulated to 46 CFR Table 72.05-10(e), standard applicable to "Lifeboat embarkation or lowering stations."
HULLS AND AIR PORTS	No special requirements beyond Subchapter H.	Must receive special treatment. See paragraph 30 of this enclosure.

**Equivalent Alternatives to 46 CFR 72.05 Requirements for  
Limitation of the Mean Length of Main Vertical Zones**

GENERAL

1. These policies have been developed as a result of public interest. In early 1992, the Coast Guard was presented with two conceptual proposals under the provisions for equivalents in 46 CFR Parts 70 and 72 for riverboat gaming vessels which incorporated main vertical zones (MVZ<sup>1</sup>s) much longer than permitted by 46 CFR Subchapter H, but which offered numerous other compensating fire safety features not required by current regulations. On April 1, 1992, the Coast Guard published a Federal Register Notice inviting interested members of the public to submit comments and proposals for alternative standards which would provide an equivalent level of safety to existing requirements and policies which limit MVZ length to a maximum of approximately 40 m. All but one of the 18 respondents favored relaxation or elimination of MVZ length limitations, with incorporation of additional fire safety requirements. Recognizing that limitation of MVZ length is a time-proven, internationally recognized standard for shipboard fire protection, the Coast Guard proceeded cautiously in developing alternative MVZ design and performance standards to ensure that they provide a level of safety commensurate with the unique risks associated with the carriage of many passengers on limited service vessels having no overnight passenger accommodations. The approach in this enclosure reflects this balance.
2. Vessels which comply with the guidelines in this enclosure may incorporate MVZ's which exceed 40 m in length, to the extent described herein.
3. Unless indicated otherwise, these guidelines must be applied in addition to those contained in enclosure (1) of this NVIC.
4. Fire safety areas which are impacted by increasing the longitudinal distance between passive fire barriers are discussed below. For simplicity, an MVZ having a length that exceeds 40 m will be referred to as a "long MVZ" or "LMVZ" in this enclosure.
  - a. Human Factors and Systems Safety. The potential for confusion and panic during emergency egress may increase with increased occupant loading of a space. This hazard can be mitigated by detecting fire early, controlling it, and extinguishing it at the incipient stage. Further, the behavior of occupants can be favorably influenced through the proper design and marking of the egress system to facilitate the orderly flow of occupants to protected refuge areas, use of passenger safety briefings, and improved control capability for notifying affected passengers of emergency situations. The latter can be accomplished via control station alarms that indicate activation of smoke detection and automatic sprinkler systems, coupled with targeted emergency announcements which can assist in the control of passenger movement. In addition, the potential for passenger entrapment due to overcrowding at exits can be reduced by installing "panic hardware" on doors which enable them to be opened under these conditions.
  - b. Smoke Detection and Alarms. The control of fire and smoke can be improved via early smoke detection and/or manual pull station alarms which alarm at a continuously manned control station. These systems provide critical early notification to persons in charge, which reduces crew response time and the start of passenger evacuation.

- c. Fire Suppression Systems. To control a fire at an incipient stage, an automatic sprinkler system is required in all accommodation and service spaces on vessels incorporating LMVZ's. These systems are quick, automatic, and reliable when properly designed and maintained. The Coast Guard considers their use essential to control fire early and compensate for the increased size of a fire affected area associated with LMVZ's. The use of Quick Response (QR) sprinkler heads is also required. These QR sprinkler heads represent a negligible cost increase and react faster when compared to conventional sprinkler heads. Because of this, QR sprinklers typically control fires with fewer heads than do conventional sprinkler systems for the types of spaces considered herein. Up-to-date guidance on the marine application of National Fire Protection Association (NFPA) Code No. 13 for design and installation of automatic sprinkler systems will be published through a separate NVIC. Fixed fire suppression systems are also required in machinery spaces.
- d. Egress System. Under existing regulations, the maximum distance between exits from a space is not specified. In addition to the "two means of escape requirement," stairtower spacing is linked to MVZ length which is set at 40 m (131 ft). In certain cases, Commandant has permitted longer MVZ's, but generally limited the extension to no more than 10% over the existing 40 m (131 ft) limitation. Thus, to ensure that passengers and crew are provided with readily accessible internal means of egress from LMVZ's, this enclosure specifies a maximum longitudinal distance between Type 1 stairtowers.

Similarly, since this NVIC permits the balance of egress capacity to be provided through stairways which lead directly to qualified refuge, direct exit doors to weather decks and/or to qualified refuge areas via MVZ bulkhead doors, the maximum horizontal distance from any point in an LMVZ to an exit forming part of a Stage I Egress route is specified. The sizing of door widths and stairs is dependent on the number of persons served, and is not a function of MVZ spacing. Thus, the guidance in enclosure (1) for determining minimum door and stair tread widths is also applicable to vessels having LMVZ<sup>1</sup>s.

- e. Directly Accessible Qualified Refuge Area (QRA) and Exit Discharge Area (EDA) Due to the difficulties that may be encountered when evacuating larger numbers of people to refuge areas, greater attention must be paid to keeping Stage I Egress routes simple. To this end, qualified refuge areas and/or exit discharge areas must be directly accessed from a public space through "simple modes," as described in paragraph 14 of enclosure (1). Where QRA's cannot be directly accessed through stairways/stairtowers or through MVZ bulkhead doors, exit discharge areas must be provided in weather deck areas immediately outside, and on the same level of the public space to be evacuated. In this way, circuitous egress routes that could potentially restrict passenger egress are avoided. The QRA's and EDA's directly accessed must be sufficiently sized and matched to the doors serving them. See Figures 1 and 2.
- f. Fire Containment and Control. By itself, an increased spacing between fire barriers on vessels incorporating longer MVZ's reduces the degree of fire and smoke containment. However, the lesser degree of fire containment permitted can be adequately compensated for with appropriate control, suppression, and refuge measures and by reducing the rate of fire growth through fuel limitation. This enclosure maintains the limitation on the combustible fuel load throughout all accommodation spaces in LMVZ's to a maximum of 14.5 kg/m<sup>2</sup> (3 lbs/ft<sup>2</sup> established in NVIC 14-91. Even when these additional safety features are included, fire barriers must still be incorporated in a vessel's fire protection

design so that egress routes and refuge areas can be adequately separated from a fire affected space.

## REQUIREMENTS

### DETERMINATION OF MAXIMUM NUMBER OF PERSONS PERMITTED

5. The guidance contained in enclosure (1) applies.

### **STAGE I EGRESS - EVACUATION OF THE SPACE OF FIRE ORIGIN AND MOVEMENT TO QUALIFIED REFUGE AREAS**

6. The guidance contained in enclosure (1) regarding "Stage I Egress" applies except as modified in this section.
7. Distance to Exits The maximum longitudinal distance between Type 1 stairtowers and distance from any point within the LMVZ's may not exceed 40 m (131 ft). The maximum horizontal distance from any point in an LMVZ to an exit door forming part of a Stage I Egress route may not exceed 22 m (72 ft).
8. Panic or Fire Exit Hardware. All doors which contribute to the required egress capacity for large public spaces located within LMVZ's must be equipped with panic or fire exit hardware. Fire exit hardware consists of a door latching assembly incorporating a device that releases the latch upon application of a force in the direction of exit travel. Such devices should:
  - a. Consist of bars or panels, the actuating portion of which extends across not less than one-half of the width of the door leaf, and not less than 76 cm (30 in) nor more than 112 cm (44 in) above the deck; and
  - b. Cause the door latch to release when a force not to exceed 65 N (15 lbf) is applied.

[NOTE: Where panic or fire exit hardware is fitted to fire rated doors or doors constructed to meet 46 CFR 72.05-25(b), the submission of fire door details should include information on the panic or fire exit hardware such as construction materials, dimensions, latch throw, and listing. Questions regarding fire door construction or testing requirements applicable to "fire rated doors" may be addressed to Commandant (G-MVI-3) .1

9. Exit Discharge Area (EDA). Paragraph 14 of enclosure (1) applies as modified herein. For LMVZ's, "simple modes of access" must open directly to qualified refuge areas and/or exit discharge areas. The requirement that protected QRA be provided for 100% of persons on board is not affected by EDA. This requirement specifically modifies paragraph 14.b of enclosure (1) where evacuation of the space includes direct egress to weather decks. For the purposes of this enclosure, an exit discharge area is defined as weather deck area located immediately outside of, and adjacent to exit doors from a large public space. The purpose of specifying minimum exit discharge area (EDA) is to ensure that occupants of a large public space can rapidly evacuate to available space during the initial surge of crowd movement in an emergency. Exit discharge areas must provide sufficient deck area immediately outside of an affected public space where an insufficient QRA is available via stairtowers/stairways or horizontally through fire doors in MVZ bulkheads.

Specifically:

- a. From an exit door, the EDA must lead in the direction of Stage I Egress to the QRA;
  - b. The EDA must provide area of not less than  $0.33 \text{ m}^2$  ( $3.5 \text{ ft}^2$ ) per person for people using the corresponding exit door;
  - c. The EDAs should not overlap, such that the allocated area for persons flowing from a given exit door into their respective EDA is not impeded by the flow of persons evacuating from other exit doors; and
  - d. The EDA width must not be less than the exit door width where one Stage I Egress route (direction) is available, and not be less than  $1/2$  the exit door width where two Stage I Egress routes are provided immediately upon passage through the corresponding exit door. In no case should the EDA width be less than 1 m (39 in).
10. Matching Exit Widths to available EDA. The available exit discharge area (EDA) should be considered when sizing exit doors to weather to ensure that the Egress system and EDA components are reasonably well matched. A simplified example is depicted in Figure 2. Assume that the door labeled "A" is sized to accommodate 100 persons. To fully utilize the egress capacity of this door, the exit discharge area (shown shaded in the figure) must have a clear deck area of at least  $0.33 \text{ m}^2/\text{person} \times 100 \text{ persons} = 33 \text{ m}^2$  to accommodate the 100 persons assumed to exit door "A" in an emergency. If less exit discharge area is provided, the number of persons assumed to exit this door must be limited accordingly.

#### QUALIFIED REFUGE AREAS

11. Location of qualified Refuge Areas. Controlling the movement of many hundreds of passengers and crew in an emergency situation is critical to the safe evacuation of a large public space. To simplify passenger movement and facilitate rapid evacuation of a fire affected space located within an LMVZ, it is recommended that, to the greatest extent possible, qualified refuge areas be provided out of the affected LMVZ for each deck level to accommodate all persons assumed to normally occupy that deck. The percentage of persons required to be provided with "out-of-zone refuge" increases with increasing LMVZ length, as shown in Figure 3.
12. Protection of Qualified Refuge Areas. The requirements of enclosure (1) apply. See Tables 1 and 2. In addition, windows installed in exterior bulkheads that face out-of-zone weather deck QRA must be protected by an exterior sprinkler water wash system. Such systems shall be installed in accordance with NVIC 10-93 "Guide to the Acceptance of NFPA 13 for Automatic Sprinkler Design, Installation and Maintenance."

#### STAGE II EGRESS - FROM QUALIFIED REFUGE AREA TO EMBARKATION DECKS

13. The alternative stairtower arrangements permitted in enclosure (1) may be incorporated in vessels having LMVZ's, subject to the following restriction. If a stairtower provides access to the embarkation deck on only one side of the vessel within an LMVZ, at least one other stairtower in that LMVZ must provide access to the embarkation deck on the opposite side of the vessel.

## SIZING OF EGRESS COMPONENTS

14. The guidance contained in enclosure (1) applies.

## LIMITATION OF COMBUSTIBLE LOAD

15. The combustible fire load contained in public spaces which lie within LMVZ's may not exceed  $14.5 \text{ kg/m}^2$  (3 lbs/ft<sup>2</sup>).

## SMOKE DETECTION AND ALARM SYSTEMS

16. Public spaces of  $465 \text{ m}^2$  (5000 ft<sup>2</sup>) or more which are not served by a Coast Guard approved smoke detection system must be served by an approved manual fire alarm system complying with the requirements of 46 CFR 76.35. Spaces other than public spaces of  $465 \text{ m}^2$  (5000 ft<sup>2</sup>) or more, which are located within an LMVZ and which present a risk of fire must be served by a Coast Guard approved smoke detection system. In large public spaces where a manual alarm system is required, alarm boxes must be located in the vicinity of each exit that contributes to the required Stage I Egress capacity.

## MULTIPLE-DECK SPACES

17. The guidance in enclosure (1) applies.

## SPECIAL FIRE PROTECTION SYSTEMS FOR ATRIUMS

18. The guidance in enclosure (1) applies.

## FIRE SUPPRESSION SYSTEMS

19. Each accommodation and service space throughout the vessel must be protected by a supervised, automatic sprinkler system equipped with quick response (QR) sprinkler heads. Two sprinkler pumps are required. Each must be able to provide the required pressure for the sprinkler system.

## LIMITATIONS ON MVZ LENGTH

20. There is no absolute limitation on the maximum length of an MVZ above the bulkhead deck. Instead, criteria included in this enclosure establishes a performance-oriented criteria that permits design flexibility while providing increased safety for greater numbers of passengers and crew as a function of increasing MVZ length as indicated in Figure 3. The percentage of the persons occupying an LMVZ who must be provided with out-of-zone (MVZ) qualified refuge area increases with increasing LMVZ length. A vessel having an LMVZ, the mean length of which is less than 61 m (200 ft)<sub>1</sub> may provide in-zone qualified refuge areas for 100% of the persons assumed to occupy that zone. A vessel having an LMVZ, the mean length of which is 61 m (200 ft) or greater, must provide out-of-zone qualified refuge areas for the percentage of persons indicated in Figure 3. The minimum percentage of occupants for which out-of-zone refuge must be provided increases linearly from 10% at a zone length of 61 m (200 ft), to 100% at a zone length of 110 m (360 ft) or more. Out-of-zone refuge areas may be internal and/or weather deck qualified refuge areas. Windows facing alternate zone weather deck refuge areas must be protected as indicated in paragraph 12, above.

21. Below the main bulkhead deck, regulatory limitations on the length of fire zones remain applicable since damage stability requirements and subdivision requirements will usually dictate additional watertight bulkheads. Since greater spacing is permitted between fire zones above the main deck, some intermediately spaced fire zone bulkheads located below the main deck will not align with main vertical zone bulkheads. However, the existence of these non-MVZ fire barriers below the main deck reduces the exposure to spaces above the main deck from a fire below decks. Each below deck fire zone must be served by a Type 1 stairtower or satisfy one of the alternative acceptable stairtower arrangements provided for in enclosure (1) of this NVIC.

#### AUTOMATIC EMERGENCY VOICE ALARM AND DIRECTIONS SYSTEM

22. An Automatic Emergency Voice Alarm and Directions System (AEVADS) must serve each vessel which incorporates an LMVZ. The AEVADS must be capable of transmitting real time, prerecorded intelligible speech messages above the high noise levels encountered under emergency conditions throughout all public spaces and any other spaces which are normally manned. AEVADS must be reviewed by Commandant, U.S. Coast Guard (G-MTH-2). Listing or classification by a Nationally Recognized Testing Laboratory to a AEVADS standard, recognized by the Commandant, may be considered as equivalent. Type approved fire or smoke alarm systems which incorporate AEVADS must be shown to not degrade the operation or performance of the alarm system. Except where indicated below, design and installation must comply with 46 CFR Subchapter J, Parts 110-113 and the National Electrical Code, and be designed to meet the following parameters:
  - a. Upon activation of the AEVADS, the alarm sequence should commence with the sounding of the General Alarm for 3 to 10 seconds, followed by AEVADS prerecorded messages. This sequence is to be repeated continuously until either the system is manually overridden or intentionally terminated at the central control station.
  - b. The minimum sound level required for the system shall conform to Title 46 CFR Subpart 113.50, and Table 113.50-15. Harmonic distortion shall not exceed 5% with a flat sound output response + 6 dB for frequencies from 500 - 5,000 Hz. The system shall be operable within 10 seconds after turning on power.
  - c. AEVADS may use components of existing shipboard announcing or entertainment systems provided that these systems meet the minimum requirements of this section. Upon activation of the AEVADS, all announcing systems or entertainment systems on line must be automatically disconnected. The system shall contain dual amplifiers and be arranged for quick shift over at the central control station. If the AEVADS is installed independent of a required Emergency Loudspeaker System (46 CFR 113.50), the installation may be made in accordance with NFPA 72, with placement of loudspeakers in accordance with 46 CFR 113.50-15. If loudspeakers are independent, use of loudspeakers should temporarily interrupt the automatic message. The loudspeaker system shall have the capability of selecting which zone(s) the manual voice message will be transmitted.
  - d. The system shall be designed to withstand the corrosive, humid, and vibratory environment aboard ship. The system must meet the survivability standards in NFPA Section 72, Chapter 10-3. The AEVADS must be fitted with a ground detection system capable of selectively monitoring individual zones. Any occurrence of an open, ground or short circuit fault in any zone shall not impact the operation of the system for any other zone; and shall not reduce the output of any other loudspeaker by more than 3 dB.

A visual and audible trouble alarm to indicate a fault in any zone is to be mounted at a central control station.

- e. The power supply for the AEVADS must be supplied from a dedicated branch circuit from the emergency switchboard with a backup of battery supply or a final emergency power source as required by 46 CFR 112.05-5 and 46 CFR 112.15-1(j). The dedicated circuit on the emergency switchboard must be clearly marked in red: "Emergency Voice Alarm Circuit Control."
- f. The records required by NFPA 72, Chapter 10-2.4, must be kept aboard the vessel and made available to the Coast Guard upon request. The vessel operator shall conduct monthly operational tests of all equipment and maintain a log of all test dates and test reports. OCMI's should require that proper operation of the AEVADS be demonstrated in random spaces served by the system during reinspections. OCMI's should witness a complete test of the AEVADS at least annually.
- g. The operator at the central control station shall have a lockout key capability to override the AEVADS in the event:
  - (1) Confirmation is received from vessel crew that the alarm is false;
  - (2) It becomes necessary to switch to throughout-vessel announcement; or
  - (3) Manual emergency announcement for a situation other than fire is required.
- h. The AEVADS should have a customized message for each large passenger space. The system shall have the capability of simultaneously delivering one message to a fire affected space(s) and another message to all other manned spaces.
- i. The AEVADS shall be activated by manual pull stations, by alarming of the fire detection system, or sprinkler flow. A single detector alarm is not to trigger the AEVADS. A 60 second time delay is to be fitted within the system to allow direct phone checks and verification of fire by ship's staff. The delay should not be fitted to manual pull station signals.
- j. The text of each message shall be provided to the cognizant OCMI evaluating the EEP to verify the accuracy and appropriateness of messages. The message delivered to the space(s) of fire origin should be as simply stated as possible. Consideration should be given to the inclusion of the following information:
  - (1) Designation of area affected;
  - (2) Instructions to exit the space of fire origin; and
  - (3) Direction to passengers to follow the instructions of the crew after exiting the space of fire origin.



#### EMERGENCY EVACUATION PLAN (EEP)

23. In addition to the information required by enclosure (1), the EEP and supporting plans must include appropriate information necessary to document the additional design features and safety systems required for vessels incorporating LMVZ's.

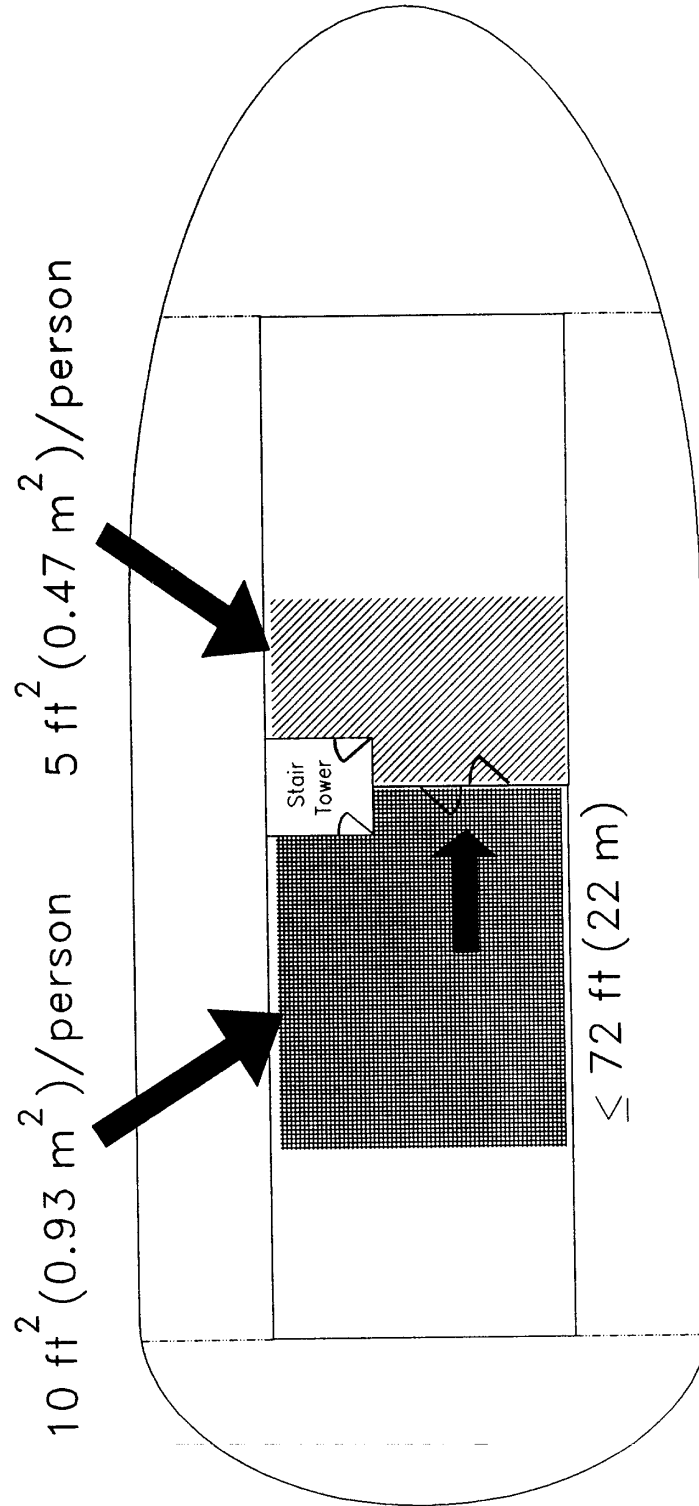


Figure 1:  
DIRECT ACCESS TO QUALIFIED REFUGE AREA (QRA)  
THROUGH MAIN VERTICAL ZONE BULKHEAD DOORS

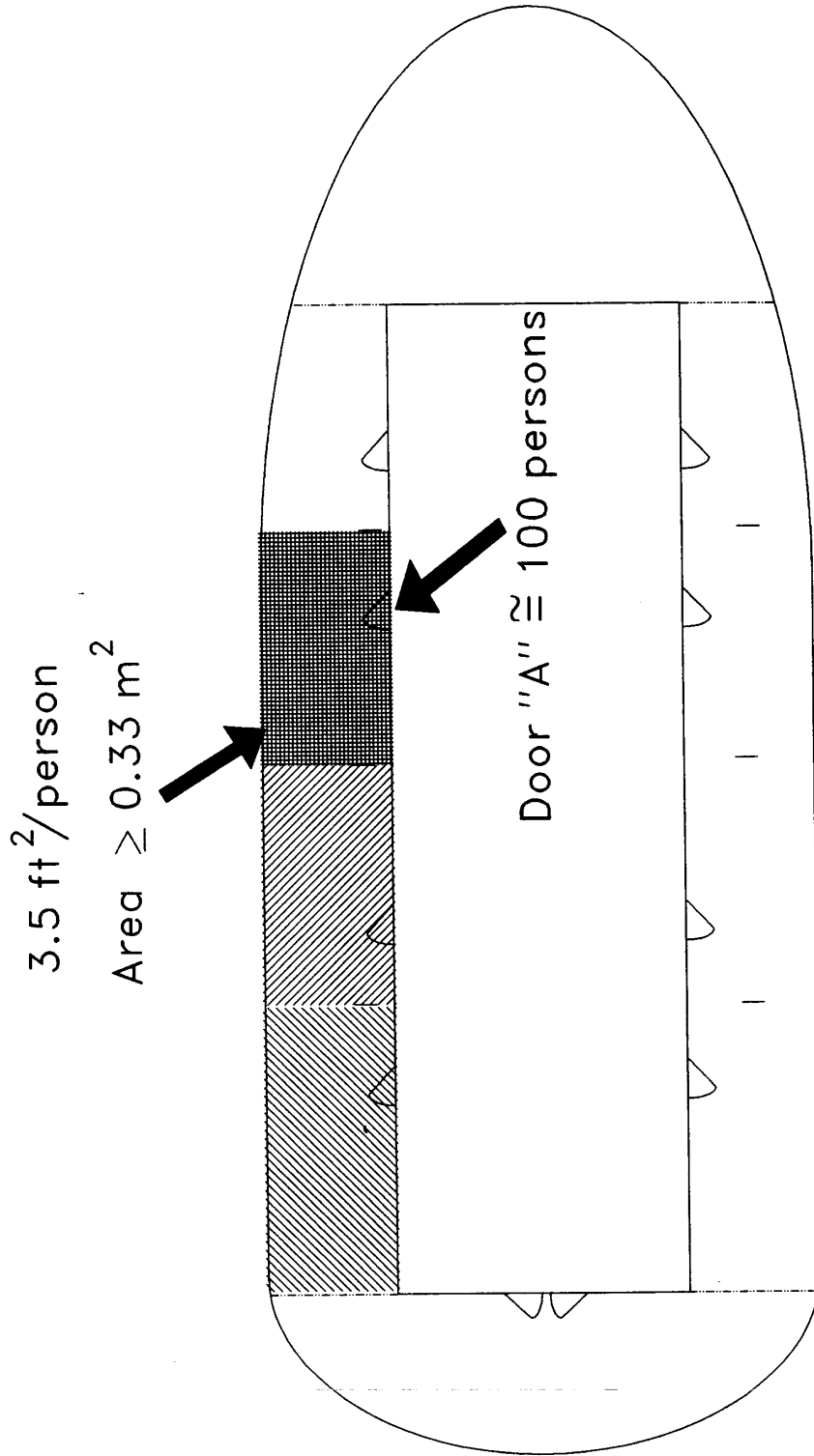


Figure 2: Matching Exit Discharge Area (EDA) to Door Width

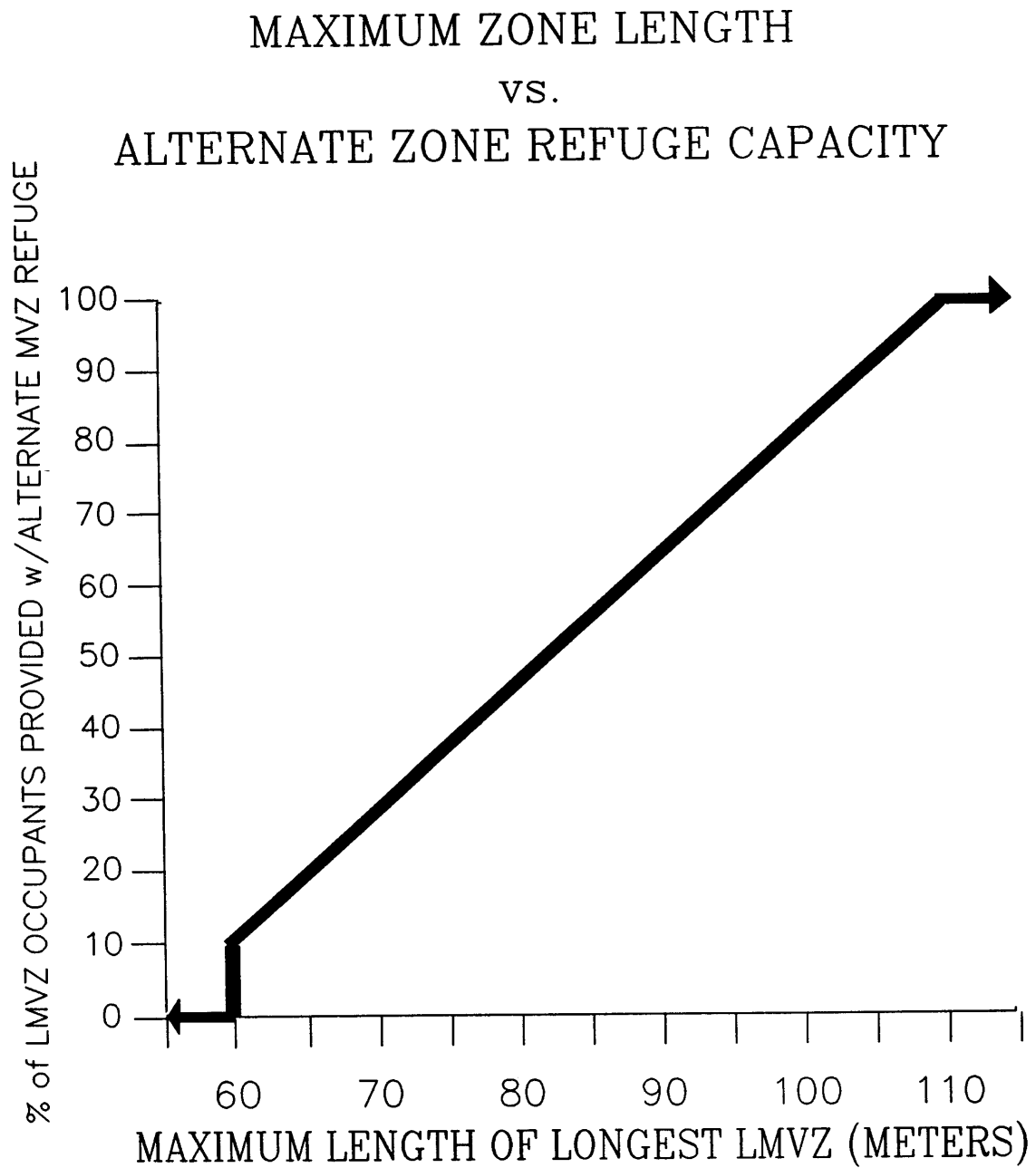


Figure 3: Out-of-Zone Refuge Requirements

**Definitions of Terms Used in Enclosures 1 and 2**

1. Passenger capacity - number of passengers permitted on a vessel. This is limited either by sizing of egress components and refuge areas, or stability of the vessel.
2. Means of egress - route of travel from passenger spaces to qualified refuge areas and embarkation decks.
3. Qualified refuge areas - spaces which are designated as areas where passengers go in an emergency. They must be properly sized, protectively bounded from fire and smoke, and provide protected access to the embarkation area.
4. Fire and smoke control and containment - keeping fire and smoke to the compartment of origin.
5. Fire suppression - control and/or extinguishment of a fire.
6. Egress components - components of egress routes (i.e., stairtowers, stairways, landing areas, doors, corridors, etc.).
7. Egress capacity - the total number of persons the aggregate of all the egress components in a single space can accommodate.
8. Embarkation area/deck - the deck from which passengers board primary lifesaving equipment. If passengers are not lowered to the water in survival craft via davits or launching devices, the embarkation deck should be the deck closest to the water, generally no more than 2.0 m (6.5 ft) above the waterline, to allow the safest access for passengers to reach lifesaving equipment, rescue vessels, or the shore, from the vessel.
9. Stage I Egress - evacuation of the space of fire origin and movement to qualified refuge areas.
10. Stage II Egress - egress from qualified refuge areas to the embarkation areas.
11. Required means of egress - those egress components necessary to meet the required egress capacity. These components must meet the requirements for sizing and protection delineated in this NVIC.
12. Main vertical zones (MVZ)- divide a vessel into vertical sections, prevent the rapid spread of fire and smoke throughout the ship, and permit fire fighters time to extinguish the fire. If the fire fighters should fail, MVZ's permit passengers and crew time to abandon ship. The mean length between MVZ bulkheads must be no longer than 40 m (131 feet).
13. Long main vertical zone (LMVZ) - an MVZ having a length that exceeds 40 m (131 feet).
14. Balconies - spaces which encompass two decks connected by a large opening in the overhead of the lower level. The second deck is actually a balcony that runs completely around the upper perimeter.

15. Atrium - similar to a balcony space, however the space consists of more than two decks and is covered at the top of the series of openings and is used for purposes other than an enclosed stairway; elevator hoistway; escalator opening; or utility shaft used for plumbing, electrical, air conditioning, or communication facilities.
16. Tread width - the width of the stair along the tread.
17. Smoke detection system - the entire smoke detection system which includes the detectors and the control station alarms and shall be Coast Guard approved and is subject to the requirements of 46 CFR 76.33.
18. Control station - those spaces in which a continuous watch is maintained and in which radio, navigation, or fire-control equipment is located.
19. Smoke extraction system - must meet the requirements of NVIC 16-91 and should be designed such that smoke exhausting from the system is unlikely to contaminate Phase I or Phase II Egress routes, refuge areas, embarkation areas, lifeboat/liferaft stowage or lowering stations, and areas where passengers and crew may need to assemble or occupy in the event of a fire.
20. Automatic sprinkler system - a sprinkler system which activates without the necessity of human intervention and is designed in accordance with NVIC 10-93.
21. Fire resistant - a descriptive term applied only to shipboard materials such as fabrics, paddings, and draperies. It denotes a considerable lower degree of fire protection than noncombustible, yet maintains a degree of protection higher than that of ordinary combustible materials used aboard vessels. The intent of specifying fire-resistant furnishings is to provide materials with a lower probability of ignition and flame propagation. It should be noted that this term does not, in all cases, denote the identical degree of fire protection used in building construction. Fire resistant furnishings are defined in 46 CFR 72.05-55.
22. Emergency Evacuation Plan (EEP) - The Emergency Evacuation Plan provides information to the master and crew regarding procedures they must carry out in the event of a shipboard fire. The EEP should generally be in the form of a pamphlet providing a written description of the various safety features and emergency procedures. In addition, the EEP should contain simplified diagrams of the vessel's emergency egress and refuge systems, and descriptions of fire protection equipment.
23. Public space - spaces such as halls, dining rooms, messrooms, lounges, cafes, and other similar spaces normally accessible during the voyage.
24. Exit discharge area (EDA)- weather deck area located immediately outside of, and adjacent to exit doors from a large public space. The purpose of specifying minimum exit discharge area (EDA) is to ensure that occupants of a large public space can rapidly evacuate to available space during the initial surge of crowd movement in an emergency.
25. Panic or fire exit hardware - enable doors to be opened under overcrowding and panic conditions.
26. Simple modes of access - easy access to a refuge area. Simple modes of access only may have one egress component (i.e., stairtower, stairway, passageway, door (except doors to and from stairtowers), etc.). This eliminates confusion in an emergency situation.

27. Out-of-zone refuge - An MVZ which provides refuge outside the MVZ of fire origin. The refuge area may be internal and/or weather deck space, however it must be outside (fore or aft) the transverse bulkheads which define the LMVZ.